



APPRENTICESHIP CURRICULUM
for
Automotive Mechatronics
Automobile Sector
Automotive Skills Development Council

**National Apprenticeship Promotion
Scheme**

1	Program Title : Automotive Mechatronics
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The B.Sc. Program in Automotive Mechatronics shall be for a duration of three years consisting of six semesters and is a judicious mix of skills relating to professional education and general education on credit based system.

The successful students will be awarded Diploma/Advanced Diploma/Degree in both Skills and General education components of the Curriculum. All the candidates continuing to diploma courses or further will be treated at par from the second semester onwards.

Students may exit after one semester or six months of studies with NSQF level 4 of Certificate or may continue to degree with level 6.

Cumulative credits awarded to the learners in skill based vocational courses

NSQF level	Skill Component Credits	General Education Credits	Total Credits for Award	Normal Duration	Exit Points / Awards
4	25	5	30	One Sem	Certificate
5	50	10	60	Two Sem	Diploma
6	100	20	120	Four Sem	Adv.Diploma
6	150	30	180	Six Sem	Degree
Total					

2	Program Code, if any							
3	Aligned NSQF approved QP/NOS and code: ASC/Q6804 - Automotive Maintenance Lead Technician-Electrical ASC/Q6803 - Automotive Maintenance Technician Electrical ASC/Q6807 - Automotive Automation Specialist ASC/Q6805 - Automotive Maintenance Lead Technician- Mechanical ASC/Q8303 – Automation and Robotics Engineer							
4	Duration of the program and NSQF level							
	Semester	Hours for General component	No. of General papers	Hours for Skill component	No. of Skill papers	Hours for OJT	QPs for skill component	NSQF level
	1	90	1	280	4	630	ASC/Q6804 ASC/Q6803 ASC/Q6807 ASC/Q6805 ASC/Q8303	4
	2	90	1	280	4	630		5
	3	90	1	245	3	630		-
	4	90	1	270	3	630		6
	5	90	1	270	3	630		-
	6	90	1	270	3	630		7
5	Certifying Body for General component Automotive Skills Development Council							
6	Certifying body for Skill Component Automotive Skills Development Council							
7	Certifying Body for On the Job training Automotive Skills Development Council							
8	Any Licensing requirements, wherever applicable							
9	Minimum eligibility criteria (Educational and/ or technical Qualification) 1. 10+ 2 (PCM Stream)/HSC (PCM) 2. 10+2 (PCB Courses) with Bridge course in Mathematics designed by TLSU 3. 10+ 2 years ITI Trade (Mechanical/ Electrical/ Electronics) 4. 10+ 3 (Polytechnic Diploma with any specialisation) Exemptions, if any							
10	Trainer’s Qualification and Experience Masters in Engineering with specialisation in Mechatronics, Mechanical, Electronics and Communication or Instrumentation and Control Preferred: Minimum 2 years of relevant industry experience							
11	NCO code and occupation							

12	Indicative list of training tools required to deliver this qualification (may be attached) Attached												
13	Assessment strategy (General component, Skill component and On the Job) Total Pass marks <table border="1" data-bbox="266 466 1268 730"> <thead> <tr> <th data-bbox="266 466 620 577"></th> <th data-bbox="620 466 984 577"> Pass Marks- Comprehensive and Continuous Evaluation </th> <th data-bbox="984 466 1268 577"> Pass Marks- Semester End Exam </th> </tr> </thead> <tbody> <tr> <td data-bbox="266 577 620 615"> General Component </td> <td data-bbox="620 577 984 615"> 40% </td> <td data-bbox="984 577 1268 615"> 40% </td> </tr> <tr> <td data-bbox="266 615 620 653"> Skill Component </td> <td data-bbox="620 615 984 653"> 40% </td> <td data-bbox="984 615 1268 653"> 40% </td> </tr> <tr> <td data-bbox="266 653 620 730"> On the Job Training Program </td> <td data-bbox="620 653 984 730"> 40% </td> <td data-bbox="984 653 1268 730"> 40% </td> </tr> </tbody> </table>		Pass Marks- Comprehensive and Continuous Evaluation	Pass Marks- Semester End Exam	General Component	40%	40%	Skill Component	40%	40%	On the Job Training Program	40%	40%
	Pass Marks- Comprehensive and Continuous Evaluation	Pass Marks- Semester End Exam											
General Component	40%	40%											
Skill Component	40%	40%											
On the Job Training Program	40%	40%											
14	Job description-brief <ul style="list-style-type: none"> • Candidates can assist design engineer, maintenance engineer or supervise maintenance activities • Supervise automation processes which includes PLC, Robotics, Hydraulics and Pneumatics • Candidates can work in service engineering department 												
15	Employment avenues/opportunities <ul style="list-style-type: none"> • Maintenance and Service Engineer • Production Engineer • Manufacturing Engineer • Automation Engineer • Project Engineer • Sales and Marketing Executive 												
16	Progression pathways <ul style="list-style-type: none"> • Candidates can pursue higher position and can grow towards the managerial positions. • Candidates can pursue masters in science with Production, Instrumentation and Control. • Candidates can go abroad for the master studies. 												
17	Curriculum update version and date Version: 1 27-01-2022												
18	Curriculum revision date												

19. Curriculum

Semester I				
Paper	Modules /unit/ Course	Key learning outcomes	Hours (theory and practical)	No of credits
Core Paper 1	Applied Mathematics	<ol style="list-style-type: none">1. Be able to synthesise and design mechatronics problem in mathematical model for analysis.2. Learner can describes mathematical situations using everyday language, actions, materials and informal recordings.3. Be able to understand the basic mathematics function and problem solving procedure.	70	4
Core paper 2	Basics of Electrical & Electronics	<ol style="list-style-type: none">1. Able to understand the characteristic of electronics components.2. Be able to measure and test electronics quantity and components.3. Understand the working principle of electronics components.4. Be able to prepare electronics circuits and demonstrate in a graphical form.	70	4
Core Paper 3	Elements of Mechanical Engineering	<ol style="list-style-type: none">1. To understand the power transmission and its terminology.2. Be able to understand the force in steady and dynamic condition.3. Be able to understand the friction and its cause.4. Be able to understand the transmission of motion by links and mechanism.	70	4
Core Paper 4	Production Drawing	<ol style="list-style-type: none">1. Study basic graphical symbols and types of drawings.2. Be able to develop the skill to visualise and represent the conceptual design in graphical from.3. Be able to read and produce the drawing sheet with all necessary technical data.	70	4

General Paper	English and Communication Skills I	<ol style="list-style-type: none"> 1. Be able to form sentences without grammatical errors. 2. Be acquainted with one word substitution, idioms and phrases commonly used in English. 3. Listen to simple structure of English language 4. Listen and comprehend 5. Remove hesitation, come forward & stand in front of class 6. Get rid of stage fear, open up and speak 7. Learn certain expressions, magical words 8. Learn correct salutations 9. Speak about oneself 10. learn more words and increase vocabulary 11. Read and comprehend 	90	5
Skill (OJT)	On-Job-Training	<ol style="list-style-type: none"> 1. To understand the work culture of industry 2. To understand the basic job roles of maintenance department 3. To understand different concepts of Mechanical and electrical components with training 4. To understand the blueprint of the manufacturing part 	630	9

Semester II				
Paper	Modules /unit/ Course	Key learning outcomes	Hours (theory and practical)	No of credits
Core Paper 1	Principles of Hydraulics and Pneumatics Systems	<ol style="list-style-type: none"> 1. Be able to understand the fluid behaviour in hydraulics and pneumatics system. 2. Design, control and understand hydraulics and pneumatics as well as electro-hydraulics and electro-pneumatic circuit. 3. Get aware of hydraulic and pneumatic system maintenance and cause of failure. 	70	4

Core paper 2	Mechanical Workshop Technology	<ol style="list-style-type: none"> 1. Be able to measure errors in measuring instruments 2. Be able to understand calibration of measuring instruments 3. • Be able to understand job marking as per production drawing 	70	4
Core Paper 3	Computer Programming and Utilisation	<ol style="list-style-type: none"> 1. Understand the C programming 2. Be able to design C program solution 3. Be able to implement C programming solution 4. Be able to test C programming solution 	70	4
Core Paper 4	Plant, Maintenance and Safety	<ol style="list-style-type: none"> 1. Be aware of importance of safety, maintenance and plant operation. 2. Will be able to identify the different types of maintenance activities. 3. Be able to monitor the equipment performance and its installation. 	70	4
General Paper	Personality Development and Job Skills I	<ol style="list-style-type: none"> 1. Learn to know about goals and set goals 2. Know necessity of formal writing and strengthen writing 3. Learn importance of grooming and etiquettes 4. Learn basics of time-management 5. Learn to work in groups and presentations 6. • Learn interpersonal relationships and skills 7. Learn importance of grooming and etiquettes 8. Learn basics of time-management 9. Learn to work in groups and presentations 10. Learn behavioural skills 	90	5
Skill (OJT)	On-Job-Training	<p>To understand the job roles related to Diploma Automotive Mechatronics</p> <ol style="list-style-type: none"> 1. Maintenance activity planning and service 2. Computer programming 3. Electronics equipment assembly 	630	9

Semester III				
Paper	Modules /unit/ Course	Key learning outcomes	Hours (theory and practical)	No of credits
Core Paper 1	Manufacturing Process and Technology	<ol style="list-style-type: none"> 1. • Understand workplace safety and its importance. 2. Be able to measure the geometry of machined object. 3. Understand machine tools and its application. 4. Able to produce finished product from given production drawing 	100	6
Core paper 2	Sensor Technology	<ol style="list-style-type: none"> 1. Understand the function, purpose and operation different types of sensors. 2. Understand the interfacing of sensors. 3. Be able to connect the sensors with different controller. 4. d. Understand the applications of different sensors. 	100	6
Core Paper 3	Introduction to Microcontroller	<ol style="list-style-type: none"> 1. Understand the basics of 8051 Microcontroller. 2. Be able to write codes for 8051 microcontroller in assembly for different applications. 3. Be able to write codes for 8051 microcontroller in embedded C for different applications. 	45	4
General Paper	English and Communication Skills II	<ol style="list-style-type: none"> 1. Have knowledge of theory of communication. 2. Be able to form grammatically correct sentences. 3. Enhance writing skill with the help of essential grammar. 4. Know the importance of English as a medium of communication in professional life. 5. Have knowledge of words used in commercial correspondence. 6. • Have knowledge of foreign words used in communication. 	90	5

		7. Listen to simple structure of English language 8. Listen, watch and comprehend 9. Develop confidence and speak on topic/s given 10. Indulge in dialogue/ conversation 11. learn more words and increase vocabulary 12. Read and comprehend		
Skill (OJT)	On-Job-Training	On job learning 1. Focus on manufacturing technology 2. Understand different departments of the company related to Manufacturing and Automation	630	9

Semester IV				
Paper	Modules /unit/ Course	Key learning outcomes	Hours (theory and practical)	No of credits
Core Paper 1	PLC Automation	1. Understand the function, purpose and operation of PLC. 2. Understand the PLC architecture, information and communication. 3. Be able to write PLC programs logic. 4. • Understand the PLC application and substitute.	85	5
Core paper 2	Control System	1. Be able to understand the components of a control system. 2. Be able to understand the time domain analysis of a control system. 3. Be able to understand the frequency domain analysis of a control system. 4. Be able to understand the state space analysis of a control system.	85	5

Core Paper 3	Industrial Instrumentation	<ol style="list-style-type: none"> 1. After learning the course the students should be able to learn basic measurement principles of temperature, level, pressure and flow sensors. 2. Student should be able to define various measurement terms, and to state and define resolution, sensitivity, accuracy and precision etc, and to classify measurement errors 3. Students should be able to identify the type of sensor and their relevant specification .etc which can be use in a particular process parameter measurement selection 	100	6
General Paper	Personality Development and Job Skills II	<ol style="list-style-type: none"> 1. Know importance of diary writing 2. Draft, identify instructions and their need 3. Interpret given data and strengthen writing 4. Learn the need of most essential personality development 5. Develop assertive behaviour, Problem solving skills and decision making. 6. • Develop stress management and creativity. 7. Learn the need of most essential personality development 8. Develop relationship between the psychological theories and its implications on personality 9. Develop strong behavioural aspects 	90	5
Skill (OJT)	On-Job-Training	<p>On Job learning as an advanced diploma Automotive mechatronics aspirant</p> <ol style="list-style-type: none"> 1. Supervising the automation equipment 2. To be able to work with instruments 3. To be able to work with automation 	630	9

Paper	Modules /unit/ Course	Key learning outcomes	Hours (theory and practical)	No of credits
Core Paper 1	Computer Aided Design	<ol style="list-style-type: none"> 1. To understand the concepts of 3D modelling and working with 3D Modelling software 2. Working with various file types of 3D model .prt, .asm, .step, .iges, .stl 3. To understand FEA fundamentals 4. To plan drawings and design based on the input of Design team 	85	5
Core paper 2	Manufacturing Planning and Scheduling	<ol style="list-style-type: none"> 1. To learn different production parameters. 2. Be aware of material import and export and handling parameters. 3. Be able to prepare shop floor documentation. 4. Be able to understand and implement Lean tools for production management. 	85	5
Core Paper 3	Rapid Prototyping	<ol style="list-style-type: none"> 1. To understand the Additive Manufacturing 2. To get awareness about various prototyping methods 3. Describe product development, conceptual design and classify rapid prototyping systems; explain stereo lithography process and applications 	100	6
Skill + general	Simulation and Modelling using advanced Excel	<ol style="list-style-type: none"> 1. Understand the design and modelling of mechatronics system 2. Use of excel in the field of automation 3. Advanced excel 	90	5
Skill (OJT)	On-Job- Training	<p>On Job learning</p> <ol style="list-style-type: none"> 1. Supervising the automation and manufacturing equipment 2. To be able to work in manufacturing planning and scheduling 3. To be able to work with automation 	630	9

Semester VI				
Paper	Modules /unit/ Course	Key learning outcomes	Hours (theory and practical)	No of credits
Core Paper 1	Industrial Robotics	<ol style="list-style-type: none"> 1. The student will understand the scope of robots in industry, research and in education. 2. Be able to program the robots based on given task 3. Be able to understand the robot terminology. 	85	5
Core paper 2	3D Printing and its Allied Operations	<ol style="list-style-type: none"> 1. To understand various 3D Printing Methods 2. Select to 3D printing machine for product generation as well as upload code files into it. 3. Use 3D printing machine for the printing of automotive components. 4. Work effectively and efficiently as per schedules and timelines. 	100	6
Core Paper 3	Computer Programming II (Python & R Programming)	<ol style="list-style-type: none"> 1. Understand the python and R programming Basics 2. Be able to write simple Python and R programs 3. Be able to implement Python and R programming solution 	85	5
General Paper	Entrepreneurship Development	<ol style="list-style-type: none"> 1. Students will be able to define, identify and/or apply:- the principles of entrepreneurial and family business; 2. the principles of viability of businesses, 3. new business proposals, and opportunities within existing businesses; 4. the principles of entrepreneurial management and growth through strategic plans, consulting projects and/or implementing their own businesses 	90	5
Skill (OJT)	On-Job-Training	On job learning <ul style="list-style-type: none"> • Be able to supervise automation equipment, • Be able to keep maintenance of manufacturing and automation equipment • Be able to work with advanced microcontroller 	630	9

19. Assessment criteria/outcome of each job role

Assessments are holistic in nature and the final result of each course is determined on the basis of continuous assessment (measured by Continuous and Comprehensive Evaluation) and performance during the Semester End Examination, in the ratio of 40:60 in case of theory courses and 60:40 in laboratory courses (practical). On-Job-Training (OJT) is jointly supervised, assessed and graded by the Faculty Supervisor of TLSU and Mentor of Industry, involving Industry Evaluation (40%) and University Evaluation (60%). The minimum pass criteria are also specified at 40% for each component of assessment. Credits are also mapped to assessment, where 1 credit is assigned 25 marks. Table 1 gives details of the University Assessment Scheme.

Table 1: **University Assessment Scheme**

Theory Course	Weightage
Comprehensive and Continuous Evaluation (Based on nature of course to include: Quiz/Presentation/Case study/Assignments/Projects/Oral evaluation, etc.)	40 %
University Semester End Evaluation (Written examination/Online examination)	60 %
Practical Course	
Comprehensive Continuous Evaluation (Based on nature of course to include: Quiz/Presentation/Practical performance/ Journal writing/ Case study/Assignments/Projects, etc.)	60 %
University Semester End Evaluation (Performance based evaluation with viva voce examination)	40 %
On Job Training	
University Evaluation	60%
Industry Evaluation	40%

- Continuous and Comprehensive Evaluation – The examination system of the University is designed to test systematically the student’s progress in theory, laboratory, and OJT (field work) through continuous evaluation. Students are given periodical tests, assignments, group assignments, surprise tests, quizzes, practical assignments, project work, presentations, home assignments, seminars, term papers in addition to examination at the end of each semester. The final result of each course is calculated on the basis of continuous assessment and performance in the semester end examination.
- Semester-end Examination - This will comprise of course wise semester-end written/online examination.
- On-Job-Training (OJT) - This will be jointly supervised, assessed and graded by Faculty Supervisor of TLSU and Mentor of Industry / Corporate, details are mentioned in Table 2

Table 2: On-Job-Training (OJT) Assessment scheme:

University Evaluation (60%)	
Evaluation Parameters	Description
Learning Report / Daily Report (20%)	Evaluated on: <ul style="list-style-type: none"> • Attendance • Log book (daily learning report) • Monthly report by Industry mentor/ Employer
Presentation and viva-voce (20%)	Evaluated on minimum 2-3 presentations per semester
Report (20%)	Evaluated on final OJT report
Industry Evaluation (40%)	
Evaluation Parameters	Description
Behavioral Feedback Report (20%)	Evaluation given by Industry mentor based on predefined behavioral parameters To be filled minimum 3 times per semester by industry mentor.
Performance Feedback Report (20%)	Evaluation given by Industry mentor based on job related performance parameters/KRAs To be filled minimum 3 times per semester by industry mentor.

OJT Evaluation Guidelines

Progress and Evaluation of On-Job-Training (OJT) will be carried out in form of University evaluation (60%) as well as Industry evaluation (40%). The candidate must obtain 40% as pass percentage in both these components individually, to be awarded credits for OJT of that Semester. Detailed breakup is as given in the Assessment Scheme.

On the Job Training Evaluation Scheme:

University Evaluation:

1. A monthly attendance sheet from employer
2. A signed copy from the employer showing the learning by the employee.
3. One presentation by candidate (to include personal details, employer details, designation, job role and work experience) as well as viva-voce, at the end of the semester.
4. A Report submitted by the candidate at the semester end.
5. A letter at the starting and at the end of the semester from the Employer.
6. A Google Form (Date, In Time, Out Time, Learning) to be filled by the candidate on a daily basis.
7. Two presentations by candidate (to include personal details, employer details, designation, job role, work experience and progress) as well as viva-voce. The first presentation to be conducted Mid- semester and the second one at the end of the semester
8. Two Reports: one mid-semester and one at semester end
9. A letter at the starting and at the end of the semester from the Employer.

Industry Evaluation:

10. Two Evaluations on Student Behaviour Feedback of the candidate (mid semester: after 2.5 months and semester end). See Annexure 1
11. Two Evaluations on the Student Performance Feedback of the candidate (mid semester: after 2.5 months and semester end) See Annexure 2

Assessment scheme:

- For On-Job-Training Certificate for onsite classroom.

UNIVERSITY EVALUATION (60%) MARKS DISTRIBUTION				
Evaluation Parameters	7 Credits	8 Credits	9 Credits	10 Credits
Learning Report / Daily Report (20%) <ul style="list-style-type: none">• Attendance• Monthly report by Industry mentor/Employer	35	40	45	50
Presentation and viva-voce (20%) <ul style="list-style-type: none">• One presentation per semester	35	40	45	50
Report (20%) <ul style="list-style-type: none">• Report write up as per the guidelines given by the University	35	40	45	50
Sub Total	105	120	135	150

INDUSTRY EVALUATION (40%) MARKS DISTRIBUTION				
Evaluation Parameters	7 Credits	8 Credits	9 Credits	10 Credits
Behavioural Feedback Report (20%) (Annexure 1) To be filled 2 times per semester by industry mentor	35	40	45	50
Performance Feedback Report (20%) (Annexure 2) To be filled 2 times per semester by industry mentor	35	40	45	50
Sub Total	70	80	90	100
Total Marks	175	200	225	250

Annexure 1

Automotive Skills Development Council					
B.Sc. Mechatronics (WIL)					
Student behavioural report by Industry Mentor					
Student Name: _____			Date : _____		
Enrollment No: _____			Company Name: _____		
Industry Mentor Name & Designation _____					
Behavioural Feedback Report					Remarks
Sr.#	Parameters	Evaluation		Total	
		1	2		
1	Communication				
2	Behavior/ Body Language/Confidence				
3	Punctuality				
4	Teamwork/collaboration skills				
5	Self-motivation/initiative				
6	Work ethic/dependability				
7	Critical thinking				
8	Flexibility/adaptability				
9	Leadership skills				
10	Working under pressure/Problem-solving skills				
1-poor; 2- satisfactory; 3- Good; 4-very good; 5-Excellent					
<u>Comments:</u>					
Faculty Mentor Sign.			Industry Mentor Sign &		
Stamp					

Annexure 2

Automotive Skills Development Council					
B.Sc. Mechatronics (WIL)					
Student Skills Check & Performance Report by Industry Mentor					
Student Name: _____			Date : _____		
Enrollment No: _____			Company Name: _____		
Industry Mentor Name & Designation _____ _____					
Performance Report					Remarks
Sr#	Parameters (for reference)	Evaluation		Total	
		1	2		
1	Job Description* 1				
2	Job Description 2				
3	Job Description 3				
4	Job Description 4				
5	Job Description 5				
1-poor; 2- satisfactory; 3- Good; 4-very good; 5-Excellent					
<u>Comments:</u>					
Faculty Mentor Sign			Industry Mentor Sign & Stamp		

* Minimum 3 JD is required in each module.

Annexure A:

List of Tools and Equipment to be attached

Sr. No	Item description	Location Department
1	Lathe Machine 3 Jaw chuck 165 mm height of centre 325 mm swing over bed 238 mm bed width 40 mm spindle bore 25.4 mm x 4 TPI lead screw dia and pitch 1 hp 1440 rpm motor	Workshop
2	Universal Milling Machine 750 x 175 mm working space 125 mm distance from spindle to underside of over support 100 mm cross feed manual 6 speed upto 562 RPM 12 feed 25.4 mm arbour 15 mm spindle bore	Workshop
3	Shaper Machine Belt & Pulley Type 12" machine size 14" max stock 26" length of ram 9" table to ram distance 1/2" min distance 5" vertical tool slide	Workshop
4	Drilling Machine Pillar type 25 mm capacity; Centre spindle to column : 228 mm Spindle Travel : 152 mm 285 x 285 table 1000 mm Spindle to base distance 90 mm pillar diameter	Workshop
5	Electrical Hacksaw Machine Mechanical type Bearing mechanical 14" size 150 mm cutting capacity 350mm blade size 88 x 157 mm stock adjusting size A-46,A-33,A-25 V belt section	Workshop
6	Bench Grinder Genuine Brand Double Ended 0.75 HP, 1.5 Amp, 440 Volts, 2800 RPM, 56 Hz	Workshop
7	Surface Grinder Horizontal head Table: 175 x 350 mm Height: 275 mm 0.01 mm gradual vertical feed 2800 rpm speed 150 x 300 mm magnetic chuck 0.5 diamond dresser 1 wheel balancing stand 600 -700 kg weight	Workshop

Sr. No	Item description	Location Department
8	Compressor Single stage double cylinder TOYO Brand 10.50 CM/KG ² (10.5 Bar) pressure Tank size: 275 Litre 3 Phase; 7.5 hp; 5.630 Kw; 650 RPM	Workshop
9	CNC Turn centre Model: DX200 10.5 kw AC main spindle motor AC servo digital drives High precision linear motion A-2-5 Spindle 8 station bidirectional servo turret 170 mm CHuck Auto Manual coolant system Tailstock with revolving centre Chip tray 2 nos boring tool holders 2 nos axial tool holders Set of soft jaw & hard jaw	Workshop
10	CNC - Vertical Machining centre Model : PX10 8.25 kW AC main spindle motor AC Servo axis High precision preloaded ball screws for X, Y & Z axes BT-40 Belt driven spindle Centralized and programmable lubrication 420 v/ 50 hz electrical cabinet Work light Chip tray Linear control Axis 3	Workshop
11	Steel Rule150 mm Ajanta x 10	Workshop
12	Steel Rule300 mm Ajanta x 3	Workshop
13	Steel RUle600 mm Ajanta x 1	Workshop
14	Outside caliper (Simple)Spring type ; 150 mm x 5	Workshop
15	Inside Caliper (Simple)150 mm x 5	Workshop
16	Vernier height gauge300 mm x 1	Workshop
17	Outside vernier caliper200 mm x 2	Workshop

Sr. No	Item description	Location Department
18	Outside micrometer0 to 25 mm x 4	Workshop
19	Measure tap5 meter x 1	Workshop
20	Spirit level12" x 1	Workshop
21	Slip gauge boxM112 x 1	Workshop
22	Combination set300 mm x 1	Workshop
23	Dial test indicatorMitutoyo make: LC 0.01 mm x 1	Workshop
24	Dial indicator standMitutoyo x 1	Workshop
25	Sine barBharat make x 1	Workshop
26	GO-NoGo plug25 mm x 1	Workshop
27	Go-No Go Snap25 mm x 1	Workshop
28	Radius Gauge1.0 to 15 mm x 1	Workshop
29	Feeler Gauge4" size x 1	Workshop
30	Wire gauge x 1	Workshop
31	Vernier Dial caliper200 mm x 1	Workshop
32	Vernier digital caliper200mm x 1	Workshop
33	Outside digital micrometer0 to 25mm x 1	Workshop
34	Outside digital micrometer25 to 50 mm range x 1	Workshop
35	Screw pitch GaugeMetric and inch x 1 set	Workshop
36	Marking Block 150 mm Sagar brand x 1 Set	Workshop
37	Hacksaw frame Nice brand x 10 Nos	Workshop
38	Tri Square 100 mm x 10	Workshop
39	Letter Punch Rabrol 3 mm ; 1 to z x 1	Workshop
40	Number Punch Rabro ; 3 ,mm ; 0 to 9 x 1	Workshop
41	Dot slot punch x 5	Workshop
42	Centre Punch 100 mm x 5	Workshop
43	Hammer 200 gm Ball pin x 5	Workshop
44	Anvill 50 kg x 1	Workshop
45	Bench vice 125 mm x 6	Workshop
46	Fire Extinguisher x 2	Workshop
47	Spanner Set Metric 6-7 to 30-32 x 12 Nos	Workshop
48	Spanner Set Inches 1/8-3/16 to 5/8-3/4 x 9 Nos	Workshop
49	Tap Wrench 12 mm x 1	Workshop
50	Measure tap Unicorn brand x 1	Workshop
51	5 Metre x	Workshop
52	Plier Taparia x 1	Workshop
53	Allen Key 8 mm x 1	Workshop
54	Tap set 10 mm Metric x 1	Workshop

Sr. No	Item description	Location Department
55	Snip (Metal Cutter) 12" x 1	Workshop
56	Cutting File ROugh ; 300 mm x 5	Workshop
57	Cutting File Smoothk 250 mm x 5	Workshop
58	Revolving Centre x 1	Workshop
59	Shaping tool holder $\frac{3}{8}$ " x 1	Workshop
60	Tool holder (lathe) $\frac{3}{8}$ " x 1	Workshop
61	Allen Key Set 1.5 to 10mm x 9 Nos	Workshop
62	V block with clamp x 2	Workshop
63	Knurling tool 6 wheel x 1	Workshop
64	Screw Spanner 380 mm x 1	Workshop
65	Drill Sleeve MT 2-3 Trumil make x 1	Workshop
66	Surface Plate 400 x 400 x64 mm x 1	Workshop
67	Angle Plate x 1	Workshop
68	Taper Shank Drill 16 mm od x 1	Workshop
69	Plain cylindrical cutter HSS; 21/2 x 3 x1" x 1	Workshop
70	Side and Face cutter 63 x 12 x 25.4 mm HSS x 1	Workshop
71	Module Cutter 3 Module No 8 x 1	Workshop
72	Hose (For gas welding) 8 mm x 5 Mtr each	Workshop
73	Cutting blow pipe Super make x 1	Workshop
74	Welding torch x 1	Workshop
75	Pressure regulator Oxygen x 1	Workshop
76	Pressure Regulator Acetylene x 1	Workshop
77	Pressure Gauge Oxygen & Acetylene both x 2	Workshop
78	Wire cable for arc welding 33 mm square x 10 mtr	Workshop
79	Earthing clamp Prima make x 1	Workshop
80	Welding rod holder 100 amp x 1	Workshop
81	Jack plane 6" x 1	Workshop
82	Firmer Chisel 30 mm x 1	Workshop
83	Mortice chisel 6 mm x 1	Workshop
84	Mortice 150 mm x 1	Workshop
85	Silicon carbide stone 150 x 50 x 25 x 1	Workshop
86	HSS taper shank drill Outside dia 20 mm x 1	Workshop
87	Ring spanner 21-23 x 1	Workshop
88	File brush x 2	Workshop
89	Crushible No.8 2 KG x 1	Workshop
90	Chuck on Indexing head x 1	Workshop
91	Welding screen x 2	Workshop

Sr. No	Item description	Location Department
92	Half round file 10" Rough x 1	Workshop
93	8" Smooth x 1	Workshop
94	Round file 8" smooth x 1	Workshop
95	Allen Key 14 mm x 1	Workshop
96	Chipping hammer x 1	Workshop
97	Shaping tool holder 3/8" x 1	Workshop
98	Plain cylindrical cutter 63 x 75 25.4 mm x 1	Workshop
99	Side and face cutter 63 x 12 x 25.4 mm x 1	Workshop
100	Bench vice 5" x 6	Workshop
101	Universal machine vice 150 mm x 1	Workshop
102	Sand Muller	Workshop
103	Sieve shaker	Workshop
104	Permeability Meter	Workshop
105	Sand Reamer	Workshop
106	Mould Hardness tester	Workshop
107	Universal Strength Machine	Workshop
108	Basic Pneumatic Training kit 1x Profile plate 3x 3/2 way push button actuation valve N.C. 1x 3/2 way push button actuation valve N.O 1x 5/2 way selector switch actuation valve 2x Pressure Gauge 1x Quick Exhaust Valve 1x 3/2 roller lever valve, idle return N.C 3x 3/2 roller lever valve direct actuation .N.C. 1x 5/2 pneumatic actuated valve, single sided 3x 5/2 pneumatic actuated valve, double sided 1x Shuttle valve (OR) 1x Dual pressure valve (AND) 1x Time delay valve/adjustable .N.C. 2x One way flow control valve 1x Pressure sequence valve 1x Single acting cylinder 2x Double acting cylinder 1x Filter regulator with gauge 1x Manifold 10x Plastic tubing PUN 4 (Mtrs) 10x T-Connector 2x Connection component set 1x Pressure regulator with gauge 5x Plastic tubing PUN 8 (Mtrs)	Mechatronics Lab
109	Add on basic electro-pneumatic training kit 1x Signal input unit, electrical 1x Relays, 3-fold	Mechatronics Lab

Sr. No	Item description	Location Department
	1x Electrical limit switch, actuated from the left 1x Electrical limit switch, actuated from the right 2x Electronic proximity sensor, with cylinder mounting 1x 5/2- way single solenoid valve with LED 2x 5/2- way double solenoid valve with LED 1x Pressure sensor with display 1x Power supply unit 1x Set of cables 1x Learntop – S	
110	Add-on sensor and & PLC training kit 1x Siemens PLC (S7-312C) with 10 digital input/6digital output 1x Programming cable 1x Proximity sensor, inductive 1x Proximity sensor, capacitive 1x Proximity sensor, optical	Mechatronics Lab
111	Add-on easy port training kit 1x Easy port USB 1x Crossover cable 1x Hand held I/O box 1x Data cable	Mechatronics Lab
112	Basic Hydraulic training kit 1x Profile plate 1x Pressure gauge 1x One way flow control valve 1x Shut off valve 1x Non return valve 0.1mpa 1x Non return valve 0.5mpa 5x Tee connector 2x Pressure relief valve 1x 2-way flow control valve 1x Non-return valve-delockable piloted 1x Double acting cylinder 16/10/200 1x 4/2 way hand lever valve with spring return 1x 4/3 way hand lever valve with closed mid-position 1x Hydraulic power pack 8x Quick coupling hose 600 mm 4x Quick coupling hose 1000 mm 2x Quick coupling hose 1500 mm 1x Pressure relief unit 1x Hydraulic distributor plate 1x Hydraulic fluid HLP-22 10l 1x Drip tray 1x Weight 1x Mounting kit for weight 1x Hose holder 1x Profile plate mtg. frame	Mechatronics Lab
113	Add-on basic electro-hydraulic training kit 1x Relay, three-fold 1x Signal input, electrical	Mechatronics Lab

Sr. No	Item description	Location Department
	1x Limit switch, electrical, left-actuated 1x Limit switch, electrical, right-actuated 1x 4/2-way solenoid valve, spring return 1x 4/3-way solenoid valve, closed mid-position 1x Mounting kit for cylinders 2x Proximity switch, electronic 1x Pressure switch, electronic 1x Power supply unit 1x Set of cables 1x ER mounting frame	
114	Workstation for pneumatic with one drawer unit (Single side)	Mechatronics Lab
115	Workstation for hydraulic with one drawer unit (Single side)	Mechatronics Lab
116	Fluidsim pneumatic simulation software, Five network licence	Mechatronics Lab
117	Fluidsim hydraulic simulation software, Five network licence	Mechatronics Lab
118	Step 7 PLC Programming software	Mechatronics Lab
119	Necessary work books: 1x Basic Pneumatic Text Book 1x Basic Pneumatic Work Book 1x Basic Electro pneumatic Text Book 1x Basic Electro pneumatic Work Book 1x PLC Text Book 1x PLC Work Book 1x Basic Hydraulic Text Book 1x Basic Hydraulic Work Book 1x Basic Electro hydraulic Text Book 1x Basic Electro hydraulic Work Book	Mechatronics Lab
120	Core i3 processor, 64bit, windows7, 4GB RAM, 500GM HDD, 2-USB ports, 1-serial port (DB9 connector), Logitech Keyboard & mouse, DVD W/R Drive	Mechatronics Lab
121	Core i5 processor, 4440M, 3.3GHz (64bit), Windows(8/8.1), 22" LCD monitors(1920x1080), 8GB RAM, 500GB HDD, 2-USB port, 1-serial port (DB9 connector), Keyboard & mouse, DVD W/R Drive	Mechatronics Lab
122	Automation Panel 1x FX3U16MT-ESS Mitsubishi PLC with 8 DI, 8 DO 1x FX3U4ADADP 4 Chanel Analog I/P 12 bit, 0-10V/4-20mA 1x FX3U4DAADP 4 Chanel Analog O/P 12 bit, 0-10V/4-20mA 1x FX3U485ADPMB RS 485 Modbus Module 1x SCADA software Iconics 75 Tags runtime license 1x FR-D740-050-EC Mitsubishi Inverter 1x MR-JE-40A servo amplifier 1x HF-KN43 AC servo motor 1.4Kg, 3-phase AC, 3000rpm, 400W 1x Power supply unit I/P 230V 50Hz AC, 1-phase, O/P 24VDC, 96W 1x RECOS RAD-R18 Relay board of 8 channel	Mechatronics Lab

Sr. No	Item description	Location Department
	2x L&T MAX-A2 3-phase contactor	
123	Steel control panel	Mechatronics Lab
124	Transformer 440V 3-phase to 220V 3-phase/1-phase	Mechatronics Lab
125	Mitsubishi make FX3U-USB-BD hardware	Mechatronics Lab
126	Mitsubishi make FX3U-4AD-TC-ADP hardware	Mechatronics Lab
127	GS Works 3 PLC Software	Mechatronics Lab
128	Mitsubishi make GS2107-WTBD HMI, 7" touch screen, 800x480, 65K, 24VDC	Mechatronics Lab
129	50 pin connector code 1Mtr for Servo amplifier	Mechatronics Lab
130	50 pin interfacing module	Mechatronics Lab
131	Pulse Generator with Frequency counter Scientech 4061, 0.3 Hz - 3 MHz / 1 Hz - 10 MHz (Sine) (Optional) <ul style="list-style-type: none"> • Sine, Square, Triangle, Ramp, Pulse and TTL outputs • 20 Vpp output and DC Offset • 40 MHz Frequency Counter • Rise time & Fall time ≤ 50 ns • 20 \times 4 character LCD • TTL output • 50 Ω Output Impedance 	Electronics lab
132	30MHz two channel oscilloscope Scientech 801, Bandwidth : DC -30 MHz (-3 dB) Risetime : 12 ns approximately Deflection coefficients : Microcontroller based 12 calibrated steps 5 mV /div. - 20 V / div. (1-2-5 sequence). Electronic control. Display on Color LCD Accuracy : ± 3 % Input Impedance : 1 MWII 30 pF approximately Input : BNC connector Input coupling : DC-AC-GND Maximum Input voltage : 400 V (DC + Peak AC)	Electronics lab

Sr. No	Item description	Location Department
133	Multiple Power Supply Scientech 4077 ,Three floating, independent DC supply voltages • DC Outputs 0 -30 V/ 2 A, 5 V/ 2 A & 0 ± 15 V Dual Tracking /1 Amp. Each	Electronics lab
134	Digital Oscillator Tektronix TBS-1072B-EDU	Electronics lab
135	Digital Multimeter	Electronics lab
136	Soldering iron 25 Watt	Electronics lab
137	Breadboard Standard size	Electronics lab
138	DC battery with cap 9volt	Electronics lab
139	Power supply cable Not applicable	Electronics lab
140	Shift register IC SN74HC595N, 8 bit register	Electronics lab
141	Zener diode 1N4735A, Reverse biased	Electronics lab
142	Voltage regulator IC 7805, output:- 5v	Electronics lab
143	Voltage regulator IC 7812, output:- 12v	Electronics lab
144	Transistor BC547, NPN type transistor	Electronics lab
145	Capacitor 4.7uF, 63v,105c	Electronics lab
146	Capacitor 4.7uF, 100v,85c	Electronics lab
147	Capacitor 10uF, 50v,105c	Electronics lab
148	Capacitor 22uF, 16v	Electronics lab
149	Capacitor 1000uF, 25v,85c	Electronics lab
150	Capacitor 47uF, 250v,105c	Electronics lab
151	Capacitor 4700uF, 16v,85c	Electronics lab
152	Capacitor 470uF, 25v,105c	Electronics lab
153	Capacitor Ceramic capacitor,102 AEC	Electronics lab
154	Capacitor Ceramic capacitor,103 Z	Electronics lab
155	LED(Red) 3mm	Electronics lab
156	LED(Red) 5mm	Electronics lab
157	LED(Green) 5mm	Electronics lab
158	LED(Yellow) 5mm	Electronics lab
159	LED(White) 5mm	Electronics lab
160	Resistor Different value(ohm-Mohm)	Electronics lab
161	Potentiometer Vary from 0volt to max.volt	Electronics lab
162	Toggle switch On and Off switch	Electronics lab
163	Connecting wires Not applicable	Electronics lab
164	Study of ALU chip(74181) omega Type LTB 824 Dimension : W 340 x H 110 x D 210 operative on 230V ±10% at 50Hz A.C. A.L.U. IC 74181.	Analog and Digital lab

Sr. No	Item description	Location Department
165	Study of various types of Flip Flop omega Type LTB 826 +5V D.C. at 100mA, IC regulated power supply operative on 230V \pm 10% at 50Hz A.C. Dimension : W 340 x H125 x D 210	Analog and Digital lab
166	Study of OR, AND and NAND gate omega Type 819 + 5V D.C. at 100mA, IC Regulated Power Supply operative on 230V \pm 10% at 50Hz A.C. Dimension : W 340 x H 125 x D 210	Analog and Digital lab
167	4- bit binary full adder and subtractor omega Type LTB 860 +5V D.C. at 200mA, IC regulated power supply 230V \pm 10% at 50Hz A.C. Dimension : W 340 x H 125 x D 210	Analog and Digital lab
168	Study of universal logic gates and applications omega Type LTB 822 +5V D.C. at 100mA, IC Regulated Power Supply operative on 230V \pm 10% at 50Hz Dimension : W340 X H125 X D210	Analog and Digital lab
169	Booleann algebra trainer omega Type LTB 818 +5V D.C. at 100mA, IC Regulated Power Supply operative on 230V \pm 10% at 50Hz Dimension : W340 X H125 X D210	Analog and Digital lab
170	4-16 Decoder Satya EDU tronics DIG 25 IC 74-154 Box Size : 250 x 200 x 50 mm Input Power Supply : 230Vac, 50Hz AC Mains Trainer consists of IC based regulated DC Power supply : 5Vdc LEDs are provided for monitoring 0 & 1 logic levels Toggle switches are provided for selection 0 / 1 logic level inputs	Analog and Digital lab

Sr. No	Item description	Location Department
171	<p>16:1 Multiplexer Satya EDU tronics DIG 26 IC 4067 Box Size : 250 x 200 x 50 mm</p> <p>Input Power Supply : 230Vac, 50Hz AC Mains</p> <p>Trainer consists of IC based regulated DC Power supply : 5Vdc</p> <p>LEDs are provided for monitoring 0 & 1 logic levels</p> <p>Toggle switches are provided for selection 0 / 1 logic level inputs</p>	Analog and Digital lab
172	<p>Power and Differential Amplifier Nvis 6522 , Mains supply : 230V \pm10%, 50Hz</p> <p>DC power supply</p> <p>Fixed : +12V, -12V, +5V, -5V</p> <p>Frequency</p> <p>Variable : 10kHz to 100kHz</p> <p>Amplitude Variable : 0 to 5Vpp</p> <p>Fuse</p> <p>Slow Blow : 500mA</p> <p>Dimensions (mm) : W 345 x D 240 x H 110</p>	Analog and Digital lab
173	<p>Shift Register Trainer Nvis6561, DC Power Supply : +5V</p> <p>Logic levels</p> <p>+5 V : High (Logic 1)</p> <p>0 V : Low (Logic 0)</p> <p>LED Indication : LED will be ON for logic high or '1' state and will be OFF for logic low or '0' state</p> <p>Dimensions (mm) : 260 W x 355 D x 125 H</p>	Analog and Digital lab
174	<p>BJT Amplifier & Emmiter follower trainer Nivs 6542, DC power supply : +12V, +5V</p> <p>Fuse : 500mA, slow blow</p> <p>Sine wave generator</p> <p>Frequency : 10Hz - 100kHz \pm10%</p> <p>Amplitude : 0 to 5Vpp</p> <p>Mains supply : 230V \pm10%, 50Hz</p> <p>Dimensions (mm) : W 240 x D 345 x H 110</p>	Analog and Digital lab

Sr. No	Item description	Location Department
175	Counter trainer Nvis 6560, DC Power Supply : +5V DC Logic levels +5V : High (Logic 1) 0V : Low (Logic 0) LED Indication : LED will be ON for logic high or '1' state and will be OFF for logic low or '0' state Dimensions (mm) : W 260 x D 355 x H125	Analog and Digital lab
176	Decimal to BCD encoder Satya Ea Tronix DIG 29, Box Size : 250 x 150 x 40 mm Input Power Supply : 230Vac, 50Hz AC Mains Trainer consists of IC based regulated DC Power supply : 5Vdc LEDs are provided for monitoring 0 & 1 logic levels Toggle switches are provided for selection 0 / 1 logic level inputs	Analog and Digital lab
177	Connecting wires for kit (Red) Not applicable	Analog and Digital lab
178	Connecting wires for kit (Black) Not applicable	Analog and Digital lab
179	Adapter i/p AC 100v-300v f=50Hz o/p 5v dc i=1A	Analog and Digital lab
180	Power supply cable 2 meter length	Analog and Digital lab
181	Microcontroller development board EPB8051-mini microcontroller,8-bit,40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage	Microcontroller lab
182	RS232 cable DB-9 connector(Female to Female)	Microcontroller lab
183	Adapter AC-DC adaptor, Input:-100-300v AC, 47-63hz input frequency, Output:- 9v DC, 1 amp current	Microcontroller lab
184	Combine module Push button, Light Emitting Diode, Liquid Crystal Display(16x2), Seven Segment Display(Common Cathode)	Microcontroller lab

Sr. No	Item description	Location Department
185	SPI protocols demonstration Include ADC and DAC ADC:- MCP3201, 8 pin, 2.7V 12-Bit A/D Converter with SPI Serial Interface, The device is capable of sample rates of up to 100 ksps at a clock rate of 1.6 MHz. The MCP3201 device operates over a broad voltage range (2.7V5.5V) DAC:- MCP4921 is a single channel, 12-bit DAC with an external voltage reference and SPI interface, 8 pin, voltage range (2.7V5.5V)	Microcontroller lab
186	Keyboard module 5x5 keyboard with 25 keys (0-9, A-F, F1-F9)	Microcontroller lab
187	ADC module ADC0809CCN, 28 pin, 8-Bit μ P Compatible A/D Converters with 8-Channel Multiplexer, 0V to 5V input range with single 5V power supply	Microcontroller lab
188	DAC module DAC0800LCN is the DAC0800 series are monolithic 8-bit high-speed digital-to-analog converters, Wide Power Supply Range: $\pm 4.5V$ to $\pm 18V$, 16 pin, Low Power Consumption: 33 mW at $\pm 5V$	Microcontroller lab
189	Arduino mega board ATmega2560 microcontroller belong to AVR family of microcontroller	Advance microcontroller lab
190	LED matrix module Dual color 8x8 led matrix	Advance microcontroller lab
191	Liquid Crystal Display 16x2 display, 16 pins	Advance microcontroller lab
192	Seven Segment Display Common Cathode type, 10 pins	Advance microcontroller lab
193	Light Dependent Resistor 5mm	Advance microcontroller lab
194	Bluetooth module HC-05	Advance microcontroller lab
195	IR sensor mudole Not applicable	Advance microcontroller lab
196	Flam sensor Not applicable	Advance microcontroller

Sr. No	Item description	Location Department
		lab
197	IR remote Not applicable	Advance microcontroller lab
198	2 channel Relay module 12v dual channel relay	Advance microcontroller lab
199	Tilt sensor Not applicable	Advance microcontroller lab
200	Ultrasonic Sensor HCSR-04	Advance microcontroller lab
201	Buzzer Piezo(B 10N)	Advance microcontroller lab
202	Temperature sensor LM35	Advance microcontroller lab
203	Push button Not applicable	Advance microcontroller lab
204	Pulse monitoring sensor Not applicable	Advance microcontroller lab
205	DC motor 200 RPM Center Shaft Metal Gear DC Motor	Advance microcontroller lab
206	Stepper motor Micro Unipolar Stepper Motor	Advance microcontroller lab
207	Servo motor SG90 Mini Micro Servo Motor for RC Helicopter Airplane Car 9g Torque	Advance microcontroller lab
208	DC motor driver IC L293D, 16 pins	Advance microcontroller lab
209	Stepper motor driver IC ULN2003, 16 pin	Advance microcontroller lab
210	Connecting wire Not applicable	Advance microcontroller lab
211	DC Motor generator set	Electrical Lab
212	Transformer short circuit open circuit set	Electrical Lab

Sr. No	Item description	Location Department
213	3 Phase induction motor break test	Electrical Lab
214	Load bank	Electrical Lab
215	Digital Multi meter - DT9205A	Electrical Lab
216	Techometer - IR	Electrical Lab
217	Clamp Meter	Electrical Lab
218	Switch board - 3 plug&switch	Electrical Lab
219	Auto-transformer	Electrical Lab
220	Characteristics of DC machine - DC Series and DC Shunt motor speed control of DC machine, 3HP/220V/1500 RPM/DC Shunt motor coupled to 1.8kW/220v/1500 RPM Series generator with base and coupling.	Electrical Lab
221	Control panel consisting inbuilt DC supply, 3 point starter, 3 nos. digital DC Ammeter, 2 nos. digital DC Voltmeter, 1 no. field rheostat, 1 no. field diverter	Electrical Lab
222	1 phase, 230v/10amp. Resistive load trolley, Working and characteristics of induction motor, Types of starting of induction motor, Speed control of induction motor	Electrical Lab
223	3HP/415v/1440RPM/TEFC/50Hz./Star or Delta connected/three phase Sq. cage induction motor with mechanical loading arrangement.	Electrical Lab
224	Control panel consisting DOL starter, TPN MCB, AC digital ammeter 1 no., AC digital voltmeter 1 no., Digital wattmeter 2 nos., all other indicators, terminal, patch cords and switches required. Panel made of MS sheet with PV facia. Basic working of transformer and basic tests.	Electrical Lab
225	1 KVA/230-115v/Air cooled transformer with enclosure.	Electrical Lab
226	Control panel consisting DP MCB, AC digital ammeter 2 nos., AC digital voltmeter 2 nos., Digital wattmeter 2 nos., 1 phase variac 1 no., all other indicators, terminals, patch cords and switches required. Panel made of MS sheet with PV facia.	Electrical Lab
227	Single phase flush mounted auto transformer, range - 0 to 270v, 5 amp	Electrical Lab